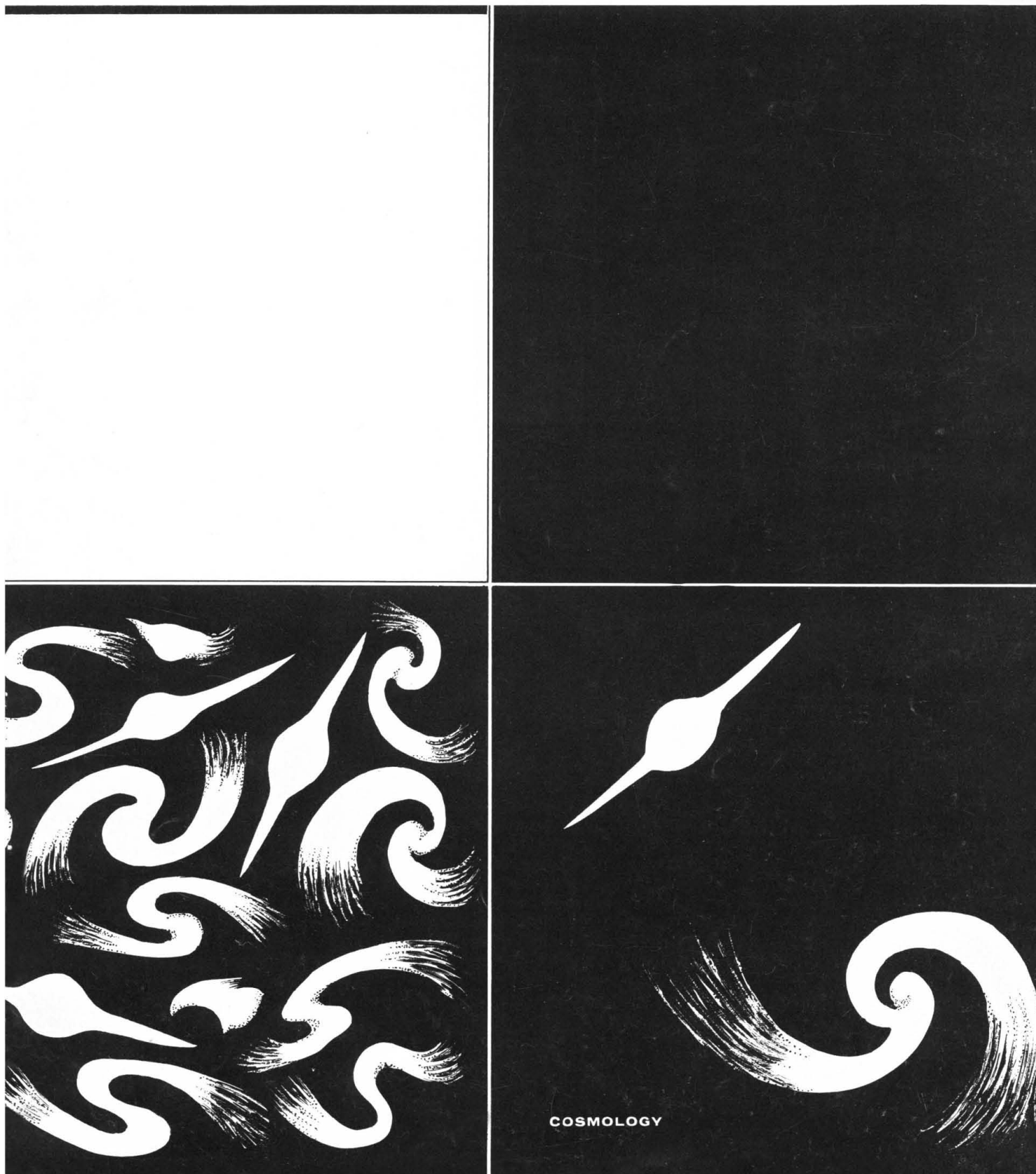


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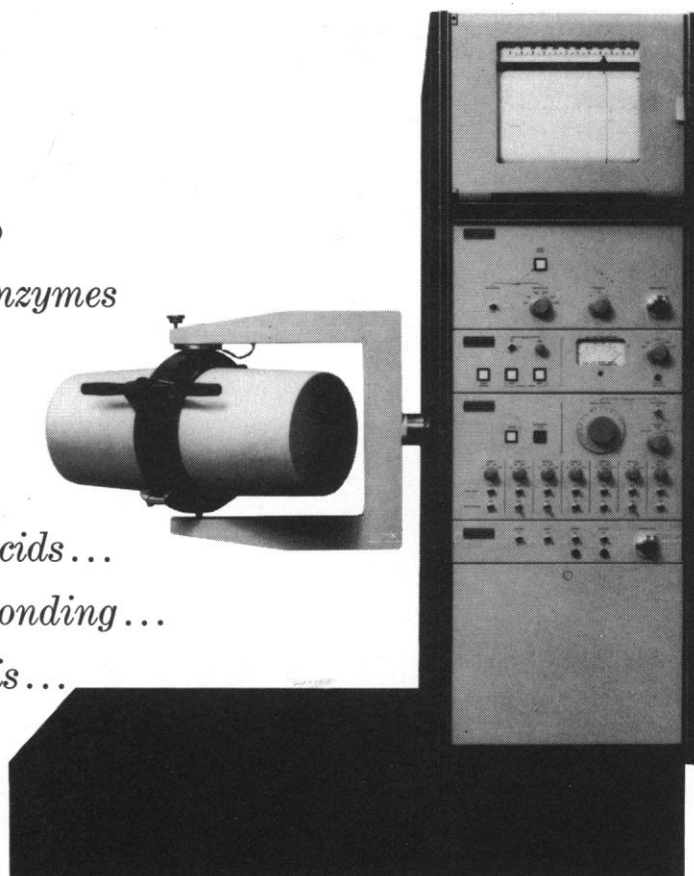
10 November 1967

Vol. 158, No. 3802

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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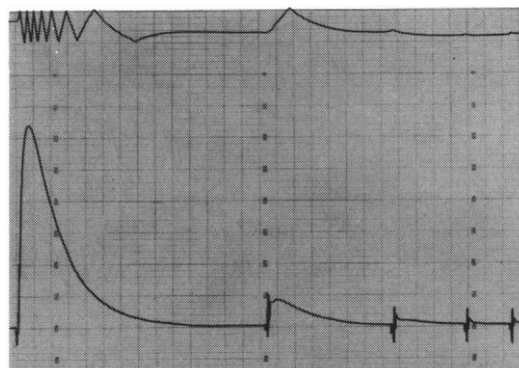
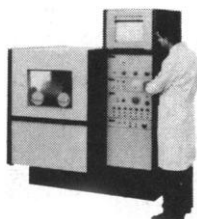


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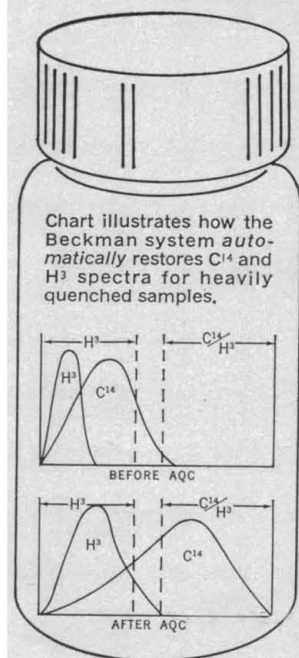
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10 November 1967

Vol. 158, No. 3802

SCIENCE

LETTERS	Latin America: Call for Conservation: <i>P. G. Heltne; M. Buchinger</i> ; Ohio's Brain Drain: <i>J. D. Mulholland</i> ; Burgeoning ABM Costs: <i>B. S. Jacobson</i> ; Essay on Criticism: <i>D. Loman</i>	717
EDITORIAL	Achievement and Management	721
ARTICLES	Radiative-Capture Studies of the Giant Dipole Resonance: <i>R. E. Segel</i>	723
	Population Policy: Will Current Programs Succeed?: <i>K. Davis</i>	730
	Ablation Thermal Protection Systems: <i>E. W. Ungar</i>	740
NEWS AND COMMENT	1967 Nobel Laureates in Physics and Chemistry: <i>V. F. Weisskopf; H. Eyring and E. M. Eyring</i>	745
	Research in Japan: U.S. Army Grants Cause Controversy	748
	New Towns: Geological Survey Has Key Role in Experiment	752
	Thermal Pollution from Nuclear Power Plants: Muskie Tells AEC To Cool It	755
	The Draft: Graduate Schools Fear Effect of New Law	757
BOOK REVIEWS	Heritage and Modernity: <i>E. R. Wolf</i>	759
	<i>Introduction to the Quantum Theory of Scattering</i> , reviewed by <i>R. C. Newton</i> ; other reviews by <i>R. J. Potter, T. V. McEvilly, L. Mandelkern, R. H. Manville, W. M. Elsasser, H. F. Blum, I. B. Bernstein</i>	762
REPORTS	History of the Universe: <i>G. Gamow</i>	766
	Atmospheric Burnup of a Plutonium-238 Generator: <i>P. W. Krey</i>	769
	Isoprenoid and Dicarboxylic Acids Isolated from Colorado Green River Shale (Eocene): <i>P. Haug, H. K. Schnoes, A. L. Burlingame</i>	772
	Tree Ring Indices: A Circumpolar Comparison: <i>R. K. Haugen</i>	773
	Sea-Floor Spreading near the Galapagos: <i>E. M. Herron and J. R. Heirtzler</i>	775
	Quishqui Puncu: A Preceramic Site in Highland Peru: <i>T. F. Lynch</i>	780
	Seismic Delay Times: Correlation with Other Data: <i>M. N. Toksöz and J. Arkani-Hamed</i> ..	783

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Stable Magnetic Remanence in Antiferromagnetic Goethite: <i>D. W. Strangeway, B. E. McMahon, R. M. Honea</i>	785
Membranes of <i>Valonia Ventricosa</i> : Apparent Absence of Water-Filled Pores: <i>J. Gutknecht</i>	787
Food Value of Red Tide (<i>Gonyaulax polyedra</i>): <i>S. Patton et al.</i>	789
5-Hydroxytryptamine in the Carotid Body of the Cat: <i>S. R. Chiocchio, A. M. Biscardi, J. H. Tramezzani</i>	790
Induction of Coiling in Tendrils by Auxin and Carbon Dioxide: <i>L. Reinhold</i>	791
Hydraulic Compression of Mice to 166 Atmospheres: <i>J. A. Kylstra et al.</i>	793
Lithophagic Snail from Southern British Honduras: <i>A. K. Craig</i>	795
"Twin Meiosis" and Other Ambivalences in the Life Cycle of <i>Schizosaccharomyces pombe</i> : <i>H. Gutz</i>	796
Boron in Plants: A Biochemical Role: <i>S. Lee and S. Aronoff</i>	798
Ice Nuclei from Direct Reaction of Iodine Vapor with Vapors from Leaded Gasoline: <i>A. W. Hogan</i>	800
Polymerization of Hemoglobins of Mouse and Man: Structural Basis: <i>J. Bonaventura and A. Riggs</i>	800
Separation of Spores from Diploid Cells of Yeast by Stable-Flow Free-Boundary Electrophoresis: <i>M. A. Resnick, R. D. Tippetts, R. K. Mortimer</i>	803
Minimum Condition for Stereopsis and Anomalous Contour: <i>R. B. Lawson and D. C. Mount</i>	804
Total Luminous Flux: A Possible Response Determinant for the Normal Monkey: <i>P. Schilder, P. Pasik, T. Pasik</i>	806
<i>Technical Comments</i> : Behavioral Thermoregulation in the Desert Iguana: <i>C. B. DeWitt; S. M. McGinnis and L. L. Dickson</i> ; Stability of Biogenetic Opal: <i>E. D. Gill</i>	809

ASSOCIATION AFFAIRS

Psychoanalytic Studies in Child Development: <i>A. J. Solnit</i> ; Adhesion in Biological Systems: <i>R. S. Manly</i>	811
---	-----

MEETINGS

Gamma Globulins: Structure and Control of Biosynthesis: <i>F. W. Putnam</i> ; Calendar of Events	813
--	-----

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COVER

Representations of the world's evolution. White box is primeval fireball; black box and box lower left represent cool and dark stage when galaxies begin to form; lower right box indicates dispersal of stellar galaxies. See page 766. [Adapted from George Gamow, by Marshall Kathan, AAAS]

The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.



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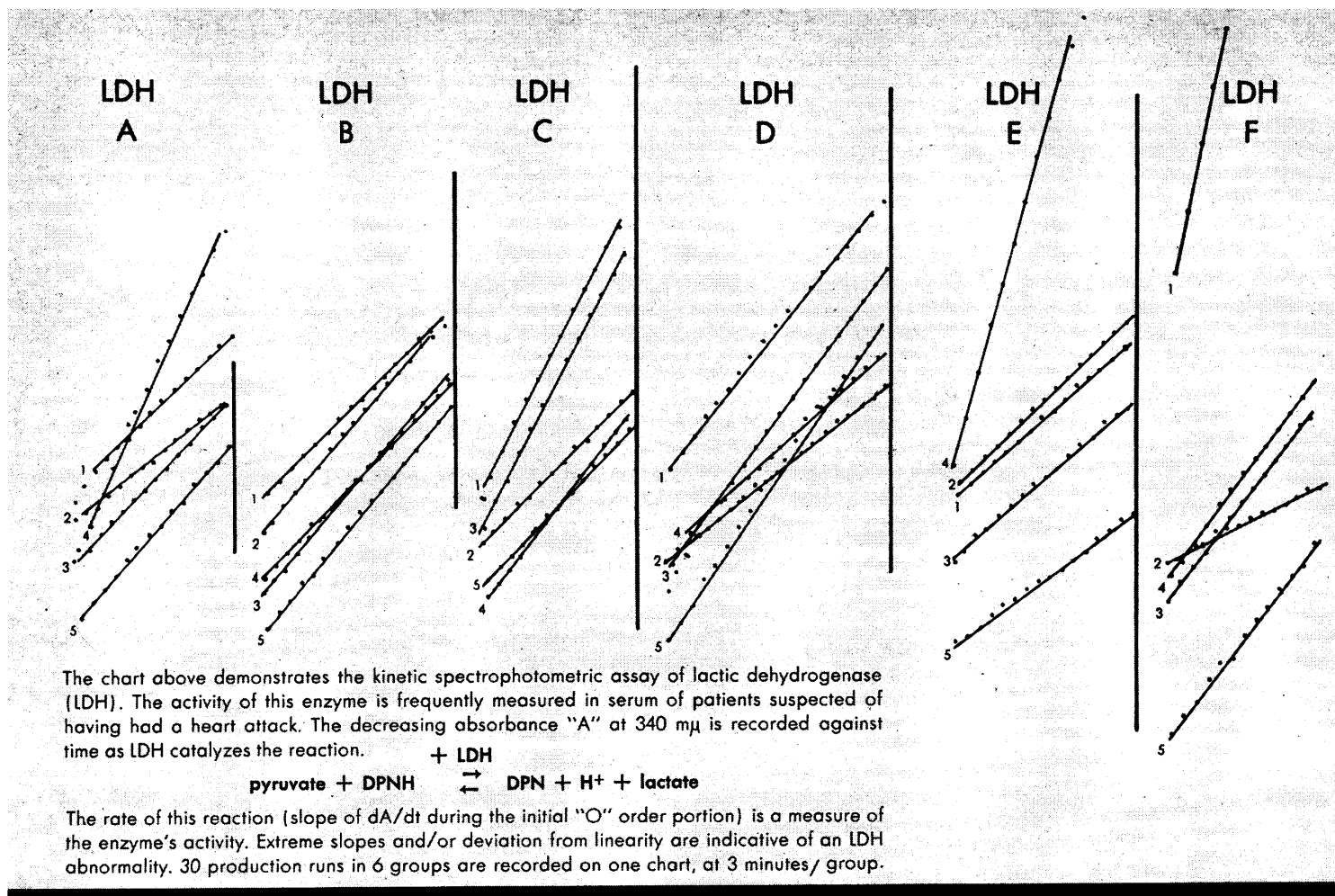
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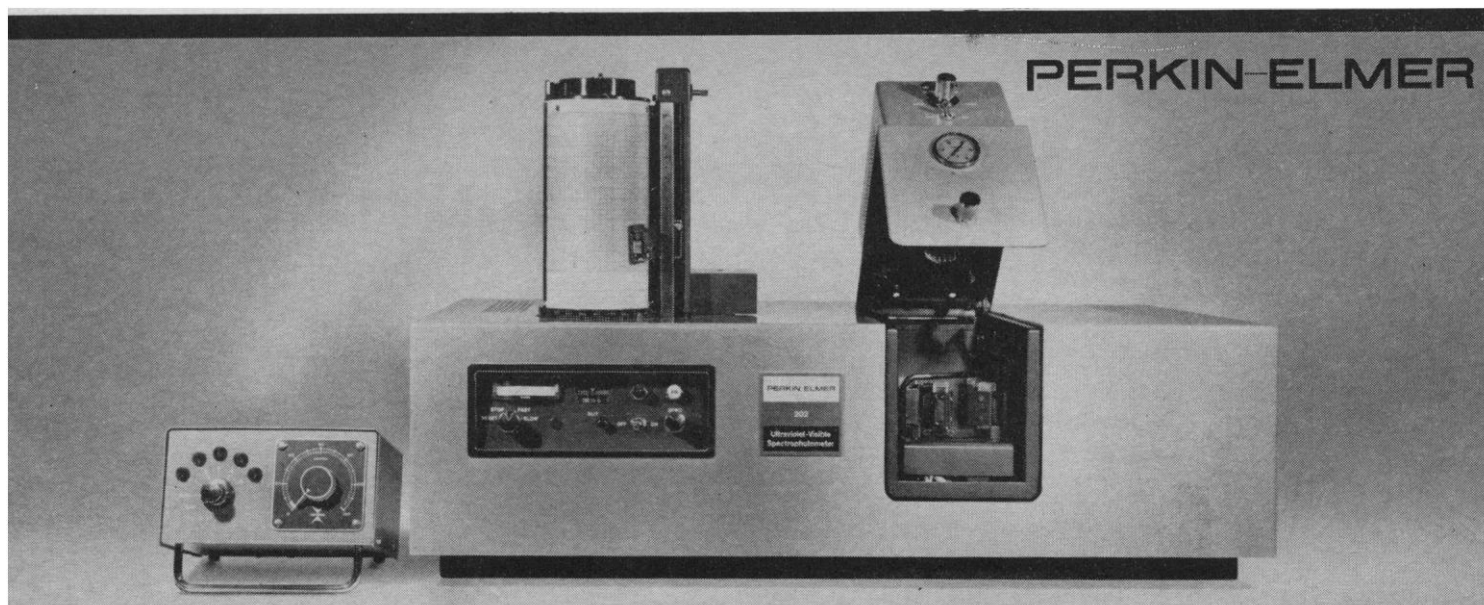
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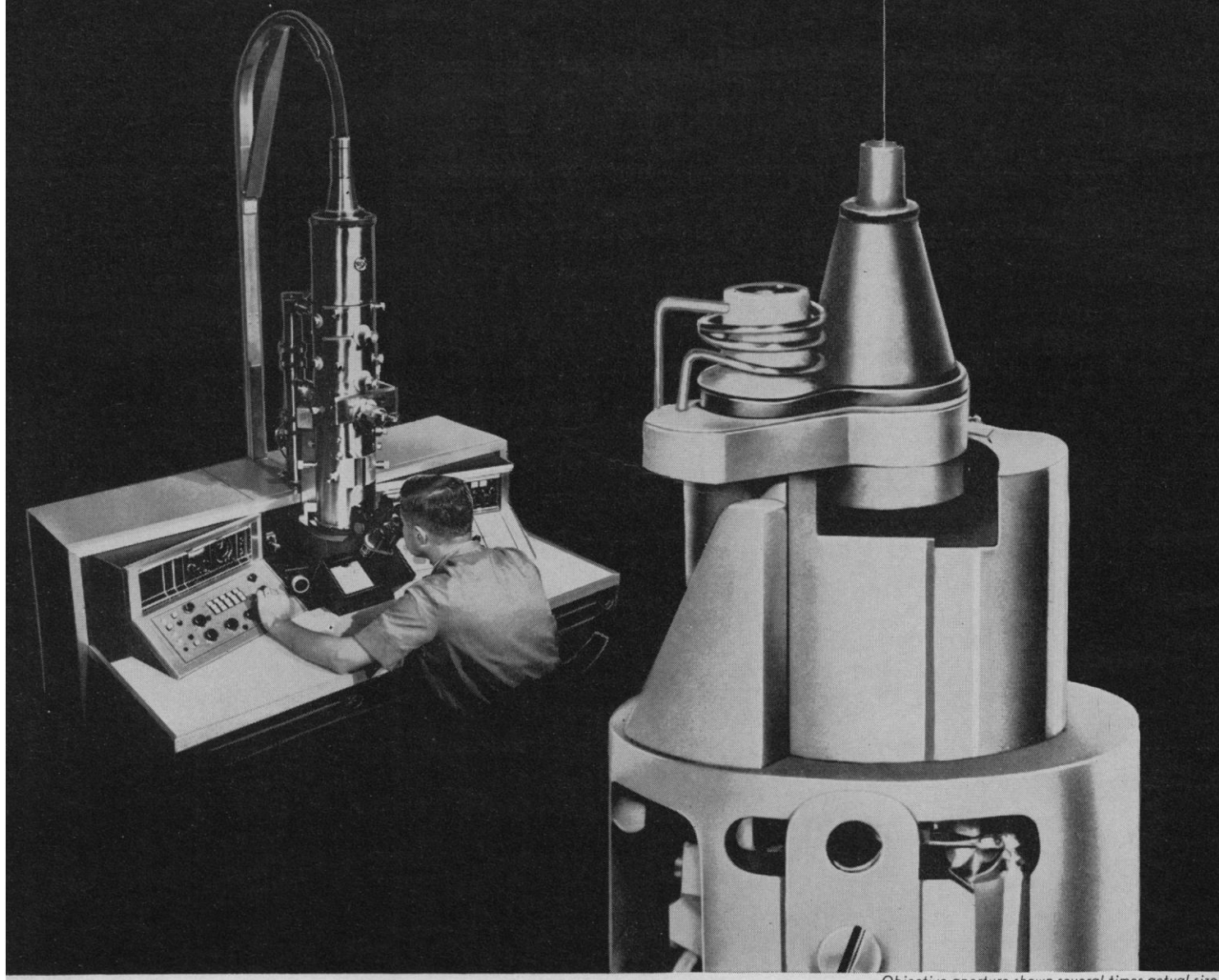
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At the same time, operators at the computer center can batch process FORTRAN and Basic Assembler Language problems through SYSTEM/360.

The first RAX system was developed at Lockheed Aircraft in Marietta, Ga.

The one-man, one-console idea began to germinate at Lockheed about four years ago. It had become apparent to people like Dr. Warren Herron, Chief of Scientific Computing, that engineers need a highly accessible computing medium to work out small computational problems requiring quick turnaround.

Aided by systems engineers from the local IBM office, Lockheed developed a program suited to its particular needs that reduced turnaround time from two or three days to a matter of seconds in most cases.

From experience gained with this and other interactive systems, IBM has now generalized and expanded RAX, adding various operational features that allow SYSTEM/360 users to select from a variety of configurations to meet their specific requirements.

Textron's Bell Aerosystems Company, for example, has a RAX installation for its engineering design work at Wheatfield, New York.

"With RAX," says R. E. Carroll, Bell's Director of Data Processing, "an engineer is no longer faced with the problem of queuing for short jobs. Previously, if he had a job that was too complex for a desk calculator, he had to stack it with others and wait as long as two days for the computer output. In the meantime he would turn to other things—in effect, he learned to time-share his work. Now the computer does the time-sharing, not the engineer."

At LTV Aerospace Corp., Dallas based subsidiary of Ling-Temco-Vought, Inc., engineers use RAX to process data from wind tunnel experiments and to solve other aircraft design problems. One typewriter-like terminal, located in the office of a vice president, is used for financial analysis and forecasting. The LTV computer center has installed 18 terminals—nearly all of them miles from the central computer; the most

distant is 200 miles away.

Illinois Bell Telephone Company headquartered in Chicago, has strategically located over 30 remote terminals throughout the company for shared-time operations. Over the next two years the number of terminals will more than double. The company uses the RAX system for a variety of jobs, such as telephone transmission and rate studies, analyzing sales performance, and identifying trends in telephone usage.

At the University of Rhode Island, visual display terminals help researchers study problems like fish population interaction. Such studies take into account mortality rates, growth rates, migration habits and other factors, and how the fishing industry and its markets are affected.

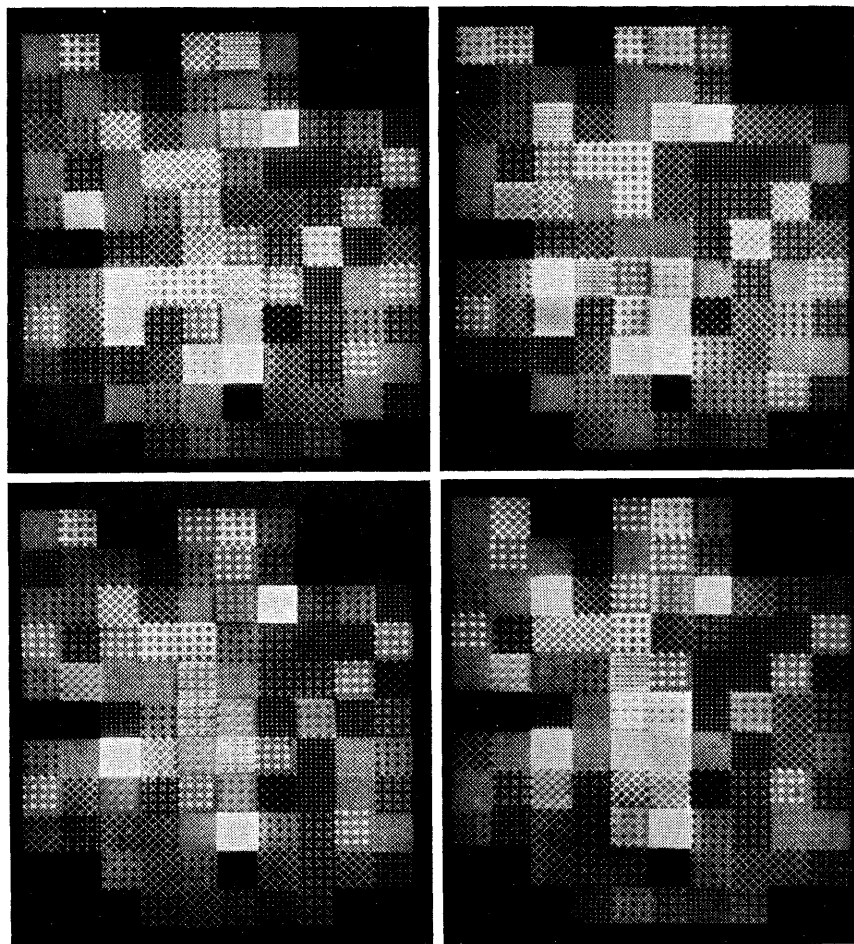
At the same time, students and faculty at other terminals elsewhere on the campus are using the central computer to find more efficient ways to transmit information electronically, to analyze urban housing characteristics and to solve other problems.

If you would like to know more about RAX and how it can help you solve your problems faster, write for a copy of the RAX brochure to: Director, Scientific Development, IBM Corporation, Department 805-354, 112 East Post Road, White Plains, New York 10601.

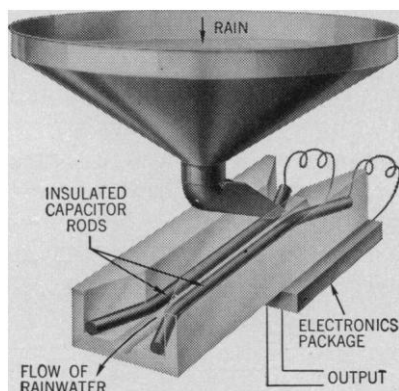
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Report from
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Photos of a rainstorm



Sequence of computer-generated rainfall-rate patterns at 10-second intervals. (Order is upper left and right, then lower left and right.) Small "patches" correspond to geographic positions of 93 rain gauges. Each patch can have one of 48 computer representations of rain rate: dark for no rain, gradually brightening for increasing rainfall. Thus, each of the four frames "maps" a rainstorm in the area, and the sequence is like a motion picture. (Detailed data are recorded on magnetic tape for analysis and correlation with radio transmission characteristics, but the display gives a quick overall view.)

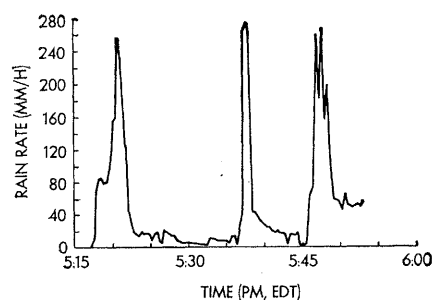


The new rain-rate gauge. Rain collected in funnel, top, flows along 45° incline between two insulated rods... the electrodes of a capacitor in an oscillator. Heavier rainfall lowers the oscillator frequency. The gauge can detect one raindrop, yet is accurate within five percent at rates of more than 10 inches per hour.

The pictures at the left represent rain on a 60-square-mile area in east-central New Jersey on November 28, 1966. Actually, they are four photos of a computer-generated display. The brightness of each little "patch" indicates the rainfall rate at each of 93 gauges spaced throughout the area.

We study rainfall because it impairs higher-frequency microwave radio transmission. But no one has had detailed data on its effects. All we had were relatively infrequent rainfall readings from a few gauges near radio paths. We needed—and now have—almost instantaneous readings of rainfall rate from closely spaced gauges over an area.

The result? We have learned a lot about rainfall—for example that heavy, small-area concentrations of rain occur and shift around within a wide-area storm. More important, we can now begin to relate rainfall patterns to specific transmission difficulties. With this information we are improving our strategies for establishing, despite the weather, more reliable radio relay paths at higher microwave frequencies.



Rainfall rate on one gauge during a storm on May 27, 1965. Note rapid response of gauge to changing intensity of rain.



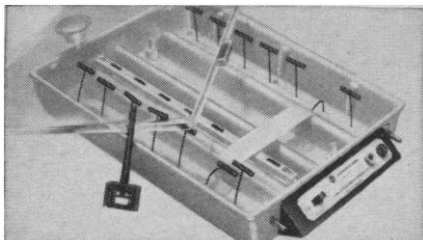
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but a basis for real corrective action will have been obtained. Berkeley did not reach its present position by virtue of preferential treatment by federal agencies. If Ohio (and other states in similar situations) decides to discard her comfortable whipping boys and attempt real improvement, both Ohio and the nation will benefit.

J. DERRAL MULHOLLAND
Post Office Box 631,
La Canada, California 91011

Burgeoning ABM Costs

The antiballistic missile program is about to receive a \$5-billion down payment from our government. This initial program may be expanded into an estimated \$40 billion project. If so, the dark financial cloud now hanging over other government programs may prove to be merely the beginning of a long night.

I am told that, in foreign policy as in other areas, governmental decisions are made by a process of accommodating diverse and conflicting interests. Scientists, whether pure, applied, or intermediate, are combatants in a long, unrelenting war against poverty, misery, disease, and ignorance. As such, we have a legitimate vested interest in advocating foreign policies which tend to keep expenditures for national defense within reasonable limits.

The scientific community needs to decide where it stands on crucial issues and then to apply pressure in appropriate places. I suggest an unbiased poll of the readers of *Science*, or of some other suitably chosen population, to determine which issues evoke some degree of consensus.

BARUCH S. JACOBSON
Radiation Biology Laboratory,
University of Minnesota Hospitals,
Minneapolis 55455

Essay on Criticism

While sympathizing deeply with McVittie's letter, "Groping through spoken English" (1 Sept., p. 992), I feel we should perhaps bear in mind the well-known words of Alexander Pope, "To 'er' is human. . . ."

DAISY LOMAN
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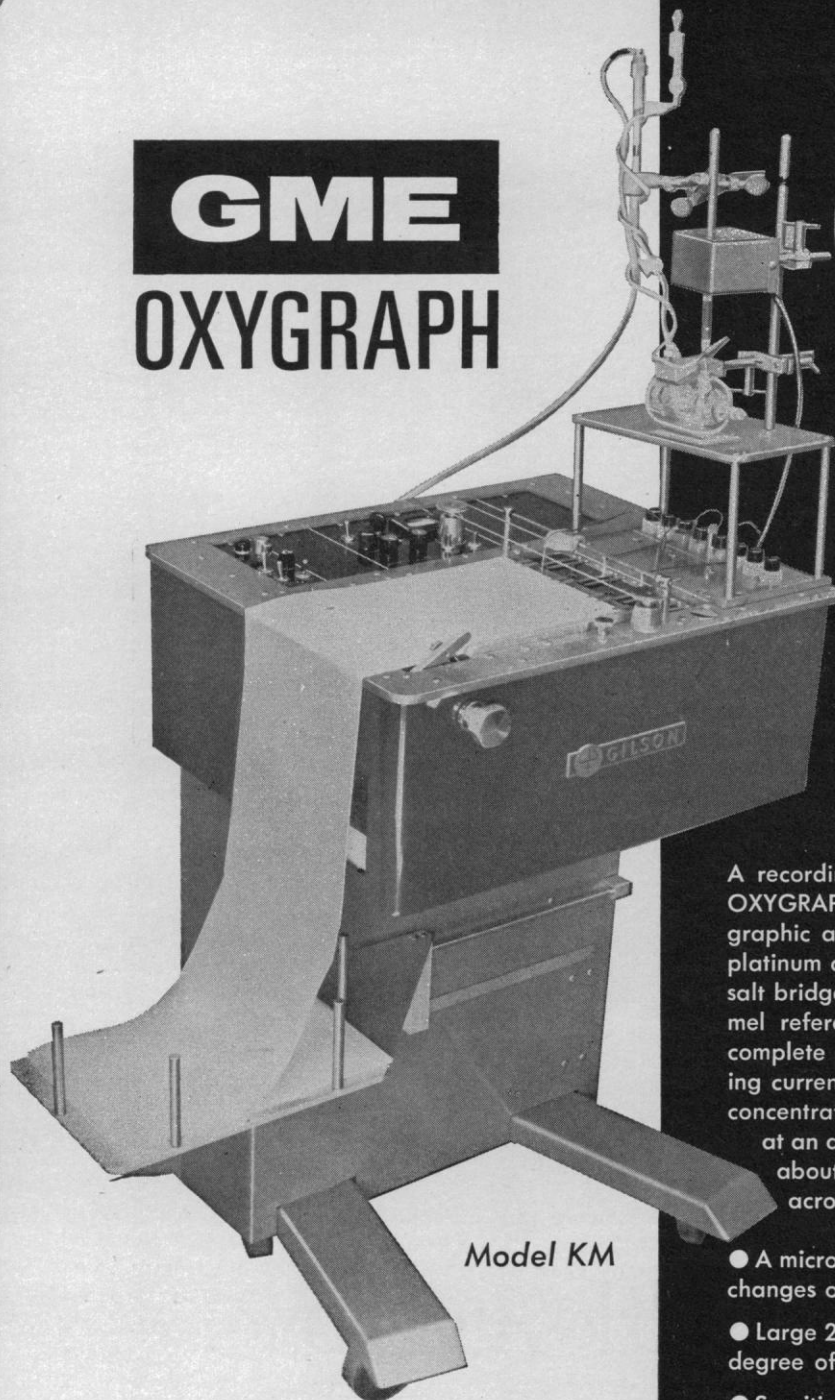
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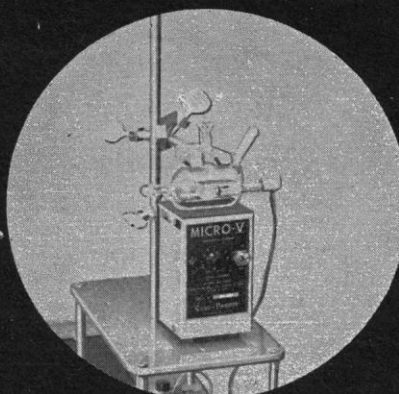


Model KM

Developed in collaboration with Dr. S. Kuby of the Enzyme Institute, University of Wisconsin, Madison.



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Achievement and Management

Last week *Science* described "one of the bitterest critiques a congressional group has ever directed at a federal research agency"—a resumption of the barrage against the Public Health Service, and the National Institutes of Health in particular, that has been fired periodically for the last half dozen years by the congressional subcommittee chaired by Representative L. H. Fountain of North Carolina. Most of the attack is directed against the management of large, general support grants, as distinct from individual project grants: NIH General Research Support grants, Health Sciences Advancement Awards, and a major research-supporting grant to the Sloan-Kettering Institute for Cancer Research. The Public Health Service will have to spend a good deal of time responding to the charges; the report gives Congressman Fountain's committee and staff a feeling of having scored some points against NIH and PHS; it identifies some faults and presents some information not previously made public. But it raises no new policy issues and it beclouds some of the most fundamental problems in the relations of the federal government to its grantees.

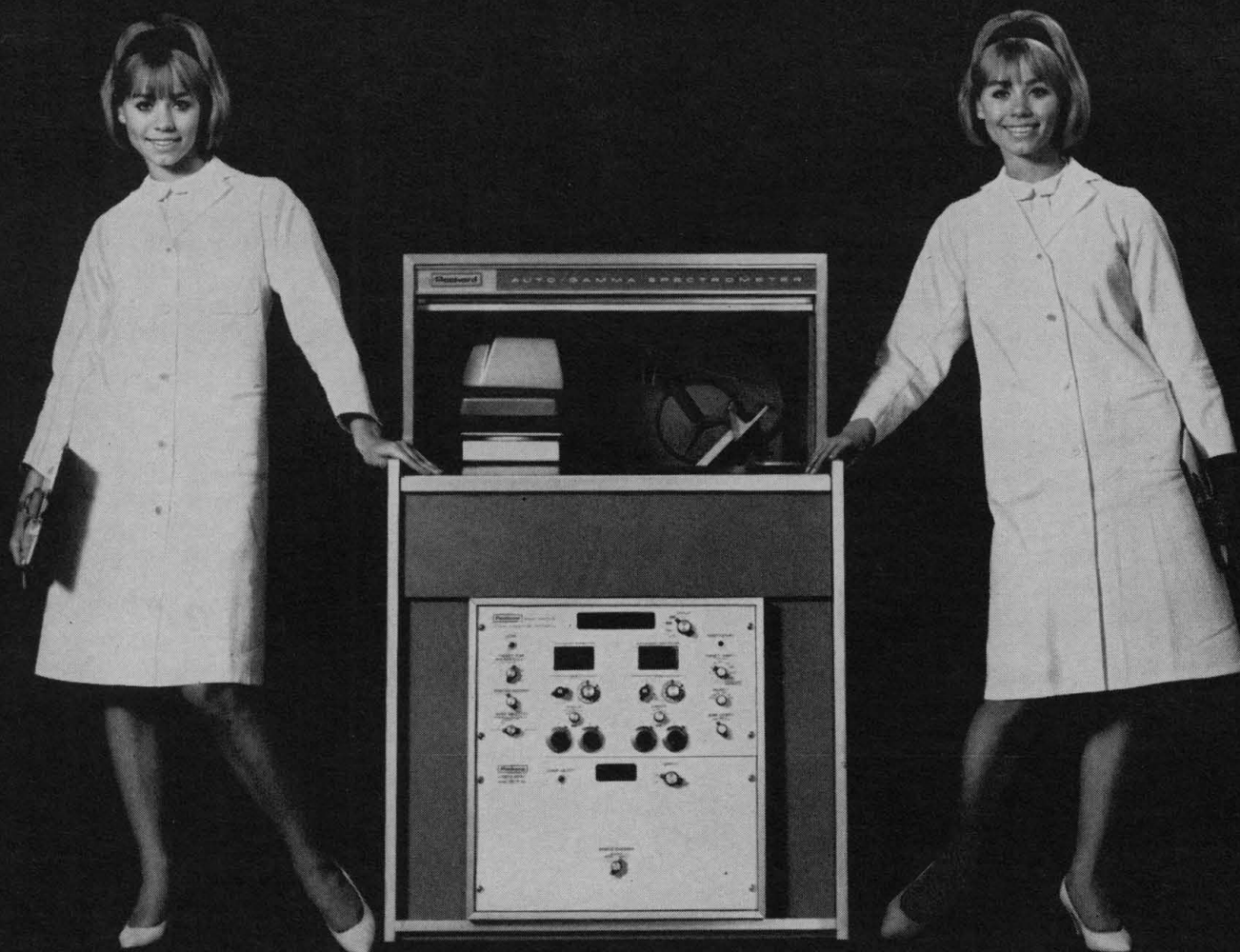
When federal research funds were small, individual project grants sufficed, and they are still the mainstay of the program. However, now that federal funds constitute a substantial fraction of the budgets of many institutions, it has become increasingly desirable that the institution, instead of a group of study panels in Washington, be made responsible for deciding how some considerable portion of its grant funds can be used most constructively. The desirability of grant programs that have this purpose, and this effect, has been agreed upon by Congress, NIH, the National Science Foundation, the National Academy of Sciences, and others. Mismanagement should be corrected wherever it is found, but it would be a disservice to the nation's biomedical program if the current report should bring about a major setback in the further development of programs of large institutional grants.

Fountain likes to quote and criticize a statement by the director of NIH: "the really significant administrative actions designed to make the program efficient and productive are . . . selection of good men and good ideas—and rejection of the inferior. . . . All subsequent administrative actions having to do with the adjustment of budgets, and so forth, are essentially trivial in relation to this basic selection process." *Trivial* was the wrong word. Yet Shannon's emphasis was correct: unless NIH selects good men and good ideas, no subsequent administrative actions can make a grant productive in advancing medical knowledge.

The issue is not one of achievement or good management. It is one of putting the two goals, each good in itself, into proper perspective; of understanding that they sometimes require accommodation; and of knowing what the priorities then are. Economy and inventory control are important in military management, but are secondary to military effectiveness. And when there is a conflict between scientific or medical achievement and compliance with all of the niceties of managerial practice, achievement has to take priority. Understanding and resolution of this issue are retarded whenever an investigator, his institution, or a granting agency takes a cavalier attitude toward good management practices. The committee likes to publicize real or imagined examples, but seems not to recognize that it has also set back the search for agreement by placing the secondary goal ahead of the primary one.—DAEL WOLFLE

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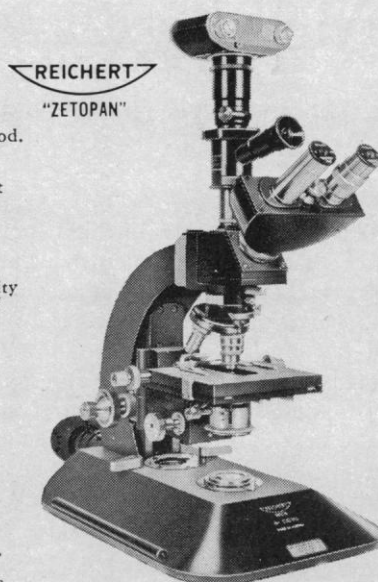
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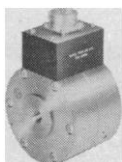
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MOLECULAR MECHANISMS OF TEMPERATURE ADAPTATION

Edited by C. LADD PROSSER
Published July 1967

A symposium presented at the Berkeley Meeting of AAAS, December 1965. AAAS Publication No. 84, 398 pages, 41 tables, 127 illustrations, bibliography, index. Regular Price \$12.50. AAAS Members' Cash Orders \$10.50.

Molecular Mechanisms of Temperature Adaptation is a collection of papers on the general physiology of temperature adaptation in cold-blooded animals, plants, and microorganisms. Twenty-four contributors from the Soviet Union, Germany, Canada, Denmark, and the United States report recent research findings on the diverse molecular mechanisms of response, acclimation, and adaptation to heat and cold in bacteria, plant cells and tissues, insects, fishes, amphibians, and reptiles.

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Calendar of Events—November

National Meetings

20-21. **Manpower for Oceanography**, education symp., Houston, Tex. (American Soc. for Oceanography, 854 Main Building, Houston 77002)

20-22. American Physics Soc., annual New Orleans, La. (J. O. Kalliokoski, Dept. of Geology, Princeton Univ., Princeton, N.J. 08540)

20-22. American Physics Soc., annual **Fluid Dynamics** mtg., Bethlehem, Pa. (P. S. Klebanoff, Natl. Bureau of Standards, Connecticut Ave. at Van Ness St., NW, Washington, D.C. 20234)

20-22. **Geological** Soc. of America, annual mtg., New Orleans, La. (G. E. Murray, Texas Technical College, Box 4680, Technical Station, Lubbock, Tex., or Miss D. Curtis, Shell Oil Co., Box 60193, New Orleans 70160)

20-22. **Geochemical** Soc., annual mtg., New Orleans, La. (E. C. T. Chao, % U.S. Geological Survey, Washington, D.C.)

20-22. **Mineralogical** Soc. of America, New Orleans, La. (G. Switzer, % U.S. National Museum, Washington, D.C.)

20-22. **Paleontological** Soc. of America,